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Scaling Diode End-Pumped Solid-State Lasers to High Average Power

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With the developments of high-average-power radiance-conditioned laser diode arrays and lens ducts, the possibility of scaling diode-pumped solid-state lasers to high average power using a longitudinal pump geometry can now be realized. Because this excitation geometry is capable of generating pump intensities on the order of 10's of kW/cm^2, power and pulse-energy scaled laser systems utilizing quasi-three-level schemes are also possible. The design of such systems generally involves a judicious balancing of the contradictory requirements needed to optimize thermal management and gain-to-loss so as to achieve overall optimum system performance. Also required, is the ability to model the delivery of the pump radiation into the laser rod or slab in order to design optimized pump transport systems. Using LLNL demonstrated high-average-power Tm:YAG and Yb:YAG diode-pumped solid-state lasers as examples, the modeling and design rationale of such systems will be reviewed in this talk.

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